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EXAMINER

WARE, CICELY Q

ART UNIT	PAPER NUMBER
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2634

DATE MAILED: 08/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/746,376

Applicant(s)

KADOUS, TAMER

Examiner

Cicely Ware

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2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 04 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

1. Claim 7 and 13 are objected to because of the following informalities:
  - a. Claim 7, lines 11 applicant uses "independent", examiner suggests using "independent" for clarification purposes.
  - b. Claim 13, lines 5 applicant uses "independent", examiner suggests using "independent" for clarification purposes.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.
3. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 17 recites means for calculating an interpolator coefficient based on said receiver multipath power profile, said interpolator coefficient independent of a channel multipath power profile of the channel separate from said receiver multipath power profile. Examiner is unclear as to whether the interpolator coefficients are "**separate from**" or "**based on**" the receiver multipath power profile". Applicant is asked to re-write the claim for clarification purposes. Claim 17 has not been further treated on the merits.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (IEEE, Robust Channel Estimation for OFDM Systems with Rapid Dispersive Fading Channels) (cited by applicant) in view of Li (US Patent 6,654,429).

(1) With regard to claim 13, Li et al. discloses estimating at least on channel, the method comprising the steps of: determining a receiver multipath profile for the at least one channel; and calculating an interpolator coefficient based on said receiver multipath profile (Pg. 906, col. 2, lines 44-53, Pg. 907, col. 1, lines 1-22).

However Li et al. does not disclose the interpolator coefficient independent of a channel multipath power profile of the channel.

However Li discloses the interpolator coefficient independent of a channel multipath power profile of the channel (col. 1, lines 54-55, col. 4, lines 26-29, col. 5, lines 14-21, col. 6, lines 55-57, col. 11, lines 16-20, 33-34).

Therefore it would have been obvious to one of ordinary skill in the art to modify Li et al. to incorporate the interpolator coefficient independent of a channel multipath power profile of the channel in order to provide for a robust interpolation and reduce the computational complexity (Li, col. 6, lines 55-59).

Li does not explicitly disclose a channel multipath power profile. However it is well known in the art that channel statistics incorporate delay profiles, which are multipath power profiles for received signals.

(2) With regard to claim 15, Li further discloses the interpolation coefficient independent of a channel multipath power profile of the channel (col. 1, lines 54-55, col. 4, lines 26-29, col. 5, lines 14-21, col. 6, lines 55-57, col. 11, lines 16-20, 33-34).

6. Claims 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edfors et al. (IEEE, OFDM Channel Estimation by Singular Value Decomposition) (cited by applicant), in view of Li (US Patent 6,654,429).

(1) With regard to claim 1, Edfors et al. discloses a method for estimating a channel, the method comprising the steps of: calculating least square channel estimate based on a training sequence (Pg. 924, col. 2, lines 8-12, 20-48); and estimating the channel based on said interpolation coefficient and said least square channel estimate (Pg. 924, col. 2, lines 8-58). However Edfors et al. does not disclose calculating an interpolation coefficient, wherein said interpolation coefficient is independent from the statistics of the channel.

However Li discloses a robust channel estimation comprising calculating an interpolation coefficient, wherein the interpolation coefficient is independent of a channel multipath power profile of the channel (col. 1, lines 54-55, col. 4, lines 26-29, col. 5, lines 14-21, col. 6, lines 55-57, col. 8, line 6, col. 11, lines 16-20, 33-34).

Therefore it would have been obvious to one of ordinary skill in the art to modify the invention of Edfors et al. to incorporate calculating an interpolation coefficient, wherein the interpolation coefficient is independent from the statistics of the channel in order to significantly improve the performance of the OFDM systems in a rapid dispersive fading channel.

7. Claims 2-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edfors et al. (IEEE, OFDM Channel Estimation by Singular Value Decomposition) (cited by applicant) in combination with Li (US Patent 6,654,429), as applied to claim 1, in further view of Li et al. (IEEE, Robust Channel Estimation for OFDM Systems with Rapid Dispersive Fading Channels) (cited by applicant).

(1) With regard to claim 2, claim 2 inherits all the limitations of claim 1. Edfors et al. in combination with Li disclose all the limitations of claim 1. However Edfors et al. in combination with Li do not disclose wherein the step of calculating an interpolation coefficient comprises the step of calculating the maximum number of resolvable multiple paths on the channel.

However Li et al. discloses wherein the step of calculating an interpolation coefficient comprises the step of calculating the maximum number of resolvable multiple paths on the channel (Pg. 904, col. 1, lines 13-46, Pg. 906, col. 2, lines 20-53, Pg. 907, col. 2, lines 1-22).

Therefore it would have been obvious to one of ordinary skill in the art to modify the inventions of Edfors et al. in combination with Li to incorporate wherein the step of

calculating an interpolation coefficient comprises the step of calculating the maximum number of resolvable multiple paths on the channel in order to significantly improve the performance of the OFDM systems in a rapid dispersive fading channel.

(2) With regard to claim 3, claim 3 inherits all the limitations of claim 2. Li et al. further discloses wherein the step of calculating an interpolation coefficient further comprises the step of constructing a receiver multipath power profile of the channel (Pg. 904, col. 1, lines 13-46, Pg. 906, col. 2, lines 44-53, Pg. 907, col. 1, lines 1-22).

(3) With regard to claim 4, claim 4 inherits all the limitations of claim 3. Li et al. further discloses wherein the step of calculating an interpolation coefficient further comprises performing a fast Fourier transform on said multipath power profile (Pg. 906, col. 2, lines 13-25).

(4) With regard to claim 5, claim 5 inherits all the limitations of claim 4. Li et al. further discloses wherein the step of calculating an interpolation coefficient further comprises the step of determining an interpolation matrix by constructing a teoplitz of the result of the step of performing a fast Fourier transform (Pg. 907, col. 1, lines 25-53).

(5) With regard to claim 6, claim 6 inherits all the limitations of claim 5. Edfors et al. further discloses wherein the step of calculating an interpolation coefficient further comprises multiplying said interpolation matrix by said least square channel estimate (Pg. 924, col. 2, line 58).

(6) With regard to claim 7, claim 7 inherits all the limitations of claim 1. Li further discloses a robust channel estimation wherein said interpolation coefficient is independent of a channel multipath power profile of the channel (col. 1, lines 54-55, col.

4, lines 26-29, col. 5, lines 14-21, col. 6, lines 55-57, col. 8, line 6, col. 11, lines 16-20, 33-34).

(7) With regard to claim 8, claim 8 inherits all the limitations of claims 7 and 2.

(7) With regard to claim 9, claim 9 inherits all the limitations of claims 8 and 3.

(9) With regard to claim 10, claim 10 inherits all the limitations of claims 9 and 4.

(10) With regard to claim 11, claim 11 inherits all the limitations of claims 10 and

5.

(11) With regard to claim 12, claim 12 inherits all the limitations of claims 11 and

6.

8. Claims 14, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (IEEE, Robust Channel Estimation for OFDM Systems with Rapid Dispersive Fading Channels) (cited by applicant) in combination with Li (US Patent 6,654,429), as applied to claims 13, 15, and 17 above, in further view of Edfors et al. (IEEE, OFDM Channel Estimation by Singular Value Decomposition) (cited by applicant).

(1) With regard to claim 14, claim 14 inherits all the limitations of claim 13 above. Li et al. in combination with Li disclose all the limitations of claim 13. However Li et al. in combination with Li do not disclose calculating a least square channel estimate for each at least one channel; and multiplying each least squares channel estimated for each at least one channel by said interpolation coefficient to estimate each least one channel.



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However Edfors et al. further discloses calculating a least square channel estimate for each at least one channel; and multiplying each least squares channel estimated for each at least one channel by said interpolation coefficient to estimate each least one channel (Pg. 924, col. 2, lines 20-46).

Therefore it would have been obvious to one of ordinary skill in the art to modify the inventions of Li et al. in combination with Li to incorporate calculating a least square channel estimate for each at least one channel; and multiplying each least squares channel estimated for each at least one channel by the interpolation coefficient to estimate each least one channel for a low complex channel estimation.

(2) With regard to claim 16, claim 16 inherits all the limitations of claim 15 above. Edfors et al. further discloses in (Fig. 3) a least squares channel estimator for calculating a least squares channel estimate for each at least one channel; and a channel estimator coupled to said least squares estimator and said coefficient interpolator, said channel estimator for multiplying each least squares channel estimate for each at least one channel by said interpolation coefficient to estimate each at least one channel (Pg 924, col. 2, lines 8-12, 20-48, Pg. 925, col. 1, lines 1-49).

(3) With regard to claim 18, claim 18 inherits all the limitations of claim 16. Li et al. further discloses in (Fig. 1 and 3) a buffer for storing a training sequence (Pg 465, col. 1, lines 20-28).

***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cicely Ware whose telephone number is 703-305-8326. The examiner can normally be reached on Monday – Friday, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 703-305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

***Cicely Ware***

cqw  
July 23, 2004

  
**STEPHEN CHIN  
SUPERVISORY PATENT EXAMINER  
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